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84616  
Japanese Kokai Patent Application No. Hei 3[1991]-284616

JP 03-284616

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Translated from Japanese by the Ralph McElroy Company, Custom  
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Code: 1505-30938

## JAPANESE PATENT OFFICE

## PATENT JOURNAL

KOKAI PATENT APPLICATION NO. HEI 3[1991]-284616

Int. Cl. <sup>5</sup> :	A 61 K 7/16 7/32 A 61 L 9/01
Sequence Nos. for Office Use:	7252-4C 7252-4C 7038-4C
Application No.:	Hei 2[1990]-86899
Application Date:	March 30, 1990
Publication Date:	December 16, 1991
No. of Claims:	1 (Total of 4 pages)
Examination Request:	Not Requested

## DEODORANTS

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[There are no amendments to this patent.]

Claims

1. Deodorants characterized by the fact that they contain hydroxyalkylated cyclodextrins, water, and lower alcohols.

Detailed explanation of the invention

Industrial application field

This invention concerns deodorants made by containing hydroxyalkylated cyclodextrins (abbreviated as HACD below), water, and alcohols, which are highly safe and have the ability to control body odors such as underarm odor, foot odor, and mouth odor.

Conventional technology

For deodorizing techniques, those resulting from neutralizing effects that rely on chemical reactions or from physical effects such as adsorption or clathration, or when microorganisms contribute to the odorous substances, along with the use of antimicrobial agents or methods of masking bad odors with strong smells, are known. For example, methods of reacting hydrogen sulfide, phenol, ammonia, mercaptans, etc., with

potassium permanganate or chlorine dioxide and changing them into nonodorous compounds, or of removing malodorous substances by allowing substances with good adsorption abilities or clathrating abilities such as activated carbon, zeolite, cyclodextrin, etc., to be present, along with methods of preventing decomposition by microorganisms by blending antimicrobial agents such as hexachlorophene or trichlorocarbanilide, as well as methods of masking bad odors with strong scents such as peppermint, cinnamon, or orange flavor, are commonly known. These deodorizing techniques are often used alone or in combinations depending on various factors such as the malodorous substance and its source, the place used, the safety, persistence of effects, etc.

Of these, the inclusion of cyclodextrins as odor-component-absorbing substances in toothpastes, mouthwashes, chewing gum, etc., is presented in Japanese Kokai Patent Application No. Sho 53[1978]-15467. The use of maltose-bonded cyclodextrins in composites that are applied to prevent body odors and mouth odors is presented in Japanese Kokai Patent Application No. Sho 63[1988]-280013 and Japanese Kokai Patent Application No. Sho 63[1988]-280014.

#### Problems to be solved by the invention

However, since the solubility of  $\beta$ -cyclodextrin in water is poor, when  $\beta$ -cyclodextrin is used, the amount blended is limited. On the other hand, since maltose-bonded cyclodextrins are difficult to produce and a uniform product quality cannot be obtained, deodorants in which these are blended also have the problem that there is an unevenness of the effects. Moreover,

with applied agents, there is the frequent problem that skin rashes occur at the application site for some people.

Upon researching the development of deodorants that are effective in controlling body odor in view of the above circumstances, the inventors discovered that of the cyclodextrin derivatives, hydroxyalkylated cyclodextrins had good clathrating abilities for malodorous substances, had a very high solubility in water, and were safe for the human body, thus completing this invention.

#### Measures taken to solve the problems

That is, this invention concerns deodorants characterized by the fact that they contain hydroxyalkylated cyclodextrins, water, and lower alcohols.

The organization of this invention is explained below.

The HACD's used in this invention are those in which hydroxyalkyl groups have been introduced into the hydroxyl groups of cyclodextrins that are well known from the past as cyclic oligosaccharides.

For hydroxyalkyl groups, mainly substituents such as hydroxymethyl, hydroxyethyl, and hydroxypropyl groups are used. As a result of these substitution reactions, HACD's such as hydroxymethyl cyclodextrin, hydroxyethyl cyclodextrin, hydroxypropyl cyclodextrin, hydroxybutyl cyclodextrin, dihydroxypropyl cyclodextrin, etc., can be obtained.

For the degree of hydroxyalkyl group substitution, 1-14 is preferable. The higher the degree of substitution, the greater the solubility in lower alcohols.

For cyclodextrins (abbreviated as CD below), CD's having  $\alpha$ ,  $\beta$ , and  $\gamma$  structures (abbreviated as  $\alpha$ -CD,  $\beta$ -CD and  $\gamma$ -CD below), depending on the differences in the number of glucose units, are known. For this invention, one, two, or more types of these CD's are hydroxyalkylated and used. Normally,  $\beta$ -CD is used. However,  $\alpha$ - or  $\gamma$ -CD can be used for the mother nucleus. Decomposed starch containing  $\alpha$ -,  $\beta$ - and  $\gamma$ -CD's can also be used.

Of these HACD's, hydroxyethylated  $\beta$ -CD or hydroxypropylated  $\beta$ -CD are preferable when the cost, ease of production, usability, and water solubility are considered. However, one is not limited to these. Moreover, in the produced state, hydroxyethylated CD or hydroxypropylated CD are mixtures in which  $\alpha$ ,  $\beta$ , and  $\gamma$  are mixed together. They can be used as mixtures or as separated  $\alpha$ ,  $\beta$  or  $\gamma$  hydroxypropylated CD's.

As means to produce the HACD's, several methods have been known in the past. One example is given below.

100 g of  $\beta$ -CD (made by Nihon Shokuhin Kako, trade name: Celdex [transliteration] N) were dissolved in 150 mL of a 20% aqueous NaOH solution. While keeping at 30°C, 50 mL of propylene oxide were gradually added in drops. This was stirred for 20 h and the reaction was continued. After completion of the reaction, this substance was neutralized to pH 6.0 with hydrochloric acid and placed in a dialysis membrane tube. Desalting was performed for 24 h with running water. Afterwards, the solution was dried in a lyophilizer and about 90 g of hydroxypropylated  $\beta$ -CD were obtained. The degree of substitution per CD of this hydroxypropylated  $\beta$ -CD was 5.1.

For the amount of HACD blended, 0.5 wt% (abbreviated as % below) to 10% of the total weight of the deodorants of the

invention is preferable. With less than 0.5% HACD, there are no effects; if it exceeds 10%, the feel during use is poor.

The lower alcohols used in this invention are ethanol, isopropyl alcohol, etc. If the amount blended of the lower alcohol is too large, it can sometimes feel irritating when applied on the human body. Blended amounts of 5-30% of the total weight of the deodorants of this invention are preferable.

The form of the deodorants of this invention is optional. They can be any form such as solids, aqueous solutions, aerosols, etc.

In the deodorants of this invention, in addition to the above essential components, fragrances, preservatives, pH adjustors, moisturizers, etc., can be added when necessary, to the extent that the effects of this invention are not lost.

#### Effects of the invention

The deodorants of this invention have high deodorizing effects and are safe for the human body.

#### Application examples

This invention is more concretely explained, citing application examples. However, this invention is not limited by these application examples. The amounts blended are in wt%.



Table I

	実施例 1	比較例 1	比較例 2	比較例 3
ヒドロキシプロピル化 $\beta$ -CD	① 5	② 1	③ 1	④ 1
$\alpha$ -CD	-	5	-	-
$\beta$ -CD	-	-	5	-
精製水	⑥ 7 残余	7 残余	7 残余	7 残余
エタノール	20	20	20	20
1,3ブチレンジグリコール	3	3	3	3
クエン酸	0.03	0.03	0.03	0.03
クエン酸ナトリウム	0.07	0.07	0.07	0.07
ヘキサメタリン酸ナトリウム	0.01	0.01	0.01	0.01
香料	0.2	0.2	0.2	0.2
メチルパラベン	0.1	0.1	0.1	0.1

- Key:
- 1 Application Example 1
  - 2 Comparative Example 1
  - 3 Comparative Example 2
  - 4 Comparative Example 3
  - 5 Hydroxypropylated  $\beta$ -CD
  - $\alpha$ -CD
  - $\beta$ -CD
  - 6 Pure water
  - Ethanol
  - 1,3 Butylene glycol
  - Citric acid
  - Sodium citrate
  - Sodium hexametaphosphate
  - Fragrance
  - Methylparaben
  - 7 Remainder

The various components in Table I were mixed and dissolved, producing body lotions.

Using Application Example 1 and Comparative Examples 1, 2, and 3, the deodorizing effects were tested by the following method.

<Testing method>

We had a total of 10 people, 5 men and 5 women, apply the substances Application Example 1 and the comparative examples under the right and left arms. Underarm odors were evaluated 3 h later by the 5-point method by a panel of experts.

The test results were as in Table II. The numerical values in the table are mean values of the evaluation results for the 5 men and 5 women; higher numerical values indicate stronger odors.

Table II

		①	②
	性別	判定値	
③	実施例 1	男 7	0
	女 9		0
④	比較例 1	男 7	3.5
	女 9		3.2
⑤	比較例 2	男 7	3.5
	女 9		3.5
⑥	比較例 3	男 7	4.0
	女 9		4.0

Key: 1 Sex  
2 Rating  
3 Application Example 1  
4 Comparative Example 1  
5 Comparative Example 2

	10
ethanol	10
dipropylene glycol	2
fragrance	0.02
methyl paraben	0.1
sodium hexametaphosphate	0.02
citric acid	0.04
sodium citrate	0.06

The various components were mixed and dissolved, producing a lotion.

Application Example 5: Aerosol body lotion [sic; powder]

hydroxypropylated B-CD	5
pure water	remainder
ethanol	20
1,3-butylene glycol	3
fragrance	0.05
methylparaben	0.1
sodium hexametaphosphate	0.01
citric acid	0.03
sodium citrate	0.07
propellant	65

The various components were mixed and filled into an aerosol can with a nozzle, producing a body lotion [powder].

Application Example 6: Shower cologne

hydroxypropylated B-CD	5
pure water	85

	11
ethanol	
	5
1,3-butylene glycol	
	2
fragrance	
	3

The various components were mixed and dissolved, producing a shower cologne.

The various application examples above were not irritating to the human body and had the ability to control body odors such as underarm odor, foot odor, and mouth odor.